Product claim

1. The invention concerns a membrane separation process for the enrichment of at least one gas component in one gas flow, especially for the oxygen enrichment of the air (7) and/or for the enrichment of carbon dioxide in a gas flow, with the purpose of enriching at least one of its components up to a membrane separation device (10), which is a part of a membrane separation unit (2), and which includes at least one membrane. Besides, it concerns the separation of the gas flow into a retentate (8), which is discharged on the retentate side (12) of the membrane, and a permeate (9), which is discharged on the permeate side (11) of the membrane, taking place on the membrane, **featuring the following**: before entering the membrane separation unit (2) the gas flow is compressed up to the inlet pressure higher than that of the air and on the permeate side (11), the level of pressure being lowered compared with the inlet pressure.

2. The invention concerns a membrane separation process for the enrichment of at least one gas component in one gas flow, especially for the oxygen enrichment of the air (7), with the purpose to enrich one of its components up to a membrane separation device (10), which is a part of a membrane separation unit (2) that includes at least one membrane. Besides, it concerns the separation of the gas flow into a retentate (8), which is discharged on the retentate side (12) of the membrane, and a permeate (9), which is discharged on the permeate side (11) of the membrane, taking place on the membrane, **featuring the following**: the gas flow is led up to the membrane separation unit (2) under the ambient pressure, the outlet pressure of the retentate (8) from the membrane separation unit (2) being lowered below the ambient pressure level and the pressure level on the permeate side (11), the level of the permeate side being lowered compared with the outlet pressure of the retentate (8).

3. The method corresponding to the claim 1 or 2 features the following: the inlet pressure of the gas flow or the outlet pressure of the retentate (8) is compressed or lowered basically according to the loss of pressure on the retentate side (12) of the membrane separation unit (2).

4. The method corresponding to one of the previous claims features the following: the volume of the permeate stream (9) and/or the concentration of the enriched component is controlled by lowering the pressure level on the permeate side (11).

5. The method corresponding to one of the previous claims features the following: the method is implemented in the form of a single-stage process.

6. The method corresponding to one of the previous claims features the following: the difference of pressure between the gas flow and the retentate (8)

should not exceed 1 bar, preferably 0.2 to 0.5 bar and/or is controlled depending on the concentration of the component that must be enriched in the permeate (9).

7. The method corresponding to one of the previous claims features the following: the permeate (9) is discharged from the membrane separation unit (2) under the absolute pressure of 0.2 to 2 bar, preferably 0.4 to 1.4 bar, more preferable is the pressure of 0.5to 1.0 bar, especially preferable is the absolute pressure lower than 1 bar and the most preferable pressure is 0.5 to 0.65 bar.

8. The method corresponding to one of the previous claims features the following: the gas flow is led up to the membrane separation unit (2) under the absolute pressure of 1 to 6 bar, preferably lower than 3 bar and especially preferable is the pressure of 1.35 to1.5 bar.

9. The method corresponding to one of the previous claims features the following: the retentate (8) is discharged under the absolute pressure of 1 to 5.5 bar, preferably lower than 2.5 bar and especially preferable is the pressure of approximately 1 bar.

10. The method corresponding to one of the previous claims features the following: the gas component that must be enriched goes through the membrane into the permeate (9).

11. The method corresponding to one of the previous claims features the following: the permeate (9) is enriched up to the oxygen concentration of 22 to 45 Vol.%, preferably 30 Vol.%.

12. The method corresponding to one of the previous claims features the following: at least one pocket module and/or plate module and/or hollow fiber module is used as a membrane separation device (10).

13. The method corresponding to one of the previous claims features the following: the gas flow is divided in at least two streams and split through a range of parallel membrane separation devices (10) and/or membrane separation units (2) installed in a membrane separation system (1).

14. The method corresponding to one of the previous claims features the following: it is foreseen that before entering the membrane separation unit (2), preferably before the compression, the gas flow is cleaned of excessive components, especially of corpuscles and/or oils and/or fat.

15. The method corresponding to one of the previous claims features the following: before entering the membrane separation unit (2), preferably after the compression, the gas flow is heated or cooled preferably by 10°C to 25°C.

16. The method corresponding to one of the previous claims features the following: before entering the membrane separation unit (2) the gas flow is freed of the condensable parts, especially water.

17. The method corresponding to one of the previous claims features the following: the separation of the gas flow takes place in the membrane separation unit (2) at environment temperature.

18. The method corresponding to one of the previous claims features the following: the compression of the gas flow before it enters the membrane separation unit (2) and/or the lowering of retentate (8) and/or permeate (9) pressure represents a single-stage process and can be carried out variously up to the previously set level of pressure.

19. The membrane separation system (1) for the enrichment of at least one gas component in one gas flow, especially for the oxygen enrichment of the air (7), preferably for carrying out the method corresponding to one of the claims 1 to18, including at least one membrane separation device (10), which, being part of a membrane separation unit (2), includes at least one membrane, with the gas flow having the purpose of enriching one of its components, is led up to a membrane separation unit (2), and the separation of the gas flow into a retentate (8), which is discharged on the retentate side (12) of the membrane, and a permeate (9), which is discharged on the permeate side (11) of the membrane, takes place on the membrane, **featuring the following**: there is a vacuuming compressor (3) for lowering the pressure level on the permeate side (11) of the membrane, especially for lowering below 1 bar.

20. The separation plant corresponding to claim 19 features the following: at least one compressor (4) for rising the inlet pressure of the gas flow is switched on before the membrane separation unit (2), or one more vacuuming compressor for lowering the outlet pressure of the retentate (8) is switched on after the membrane separation unit (2).

21. The separation plant corresponding to claims 19 or 20 features the following: at least one heat exchanger (5) for cooling or heating of the gas flow is switched on before the membrane separation unit (2).

22. The separation plant corresponding to one of the previous claims 19 to 21 features the following: the membrane separation unit (2) includes at least one membrane separation device (10), whereas at least one pocket module and/or plate module and/or hollow fiber module is used as a membrane separation device (10).

23. The separation plant corresponding to one of the previous claims 19 to 22 features the following: at least one device, preferably a filter (6), for cleaning out of the gas flow of excessive components, especially particles and/or oils

and/or fat is switched on before the membrane separation unit (2), preferably before the compressor (3).

24. The separation plant corresponding to one of the previous claims 19 to 23 features the following: the membrane separation unit (2), the vacuuming compressor (3), the compressor (4) or another vacuuming compressor are packed into transportable cases and represent a mobile unit.

25. A system for the enrichment of at least one gas component in one gas flow, especially for the oxygen enrichment of the air (7), preferably for carrying out the method corresponding to one of the claims 1 to 18, **featuring the following**: there is a range of membrane separation systems (1) corresponding to one of the claims 19 to 24, which are preferably installed concurrently.

26. Use of the membrane separation process corresponding to one of the claims 1 to 18 and/or at least one membrane separation system (1) corresponding to one of the claims 19 to 24 to produce oxygen-enriched air for burning gases wit a low caloric value and/or ballasted combustion gases in gas-powered engines, especially landfill gases, gasification gases, sewage gases or biogases.

27. Use of the membrane separation process corresponding to one of the claims 1 to 18 and/or at least one membrane separation system (1) corresponding to one of the claims 19 to 24 to produce the oxygen-enriched air in a sporting center, especially in a health spa, etc. or in an air-conditioning installation.

28. Use of the membrane separation process corresponding to one of the claims 1 to 18 and/or at least one membrane separation system (1) corresponding to one of the claims 19 to 24 to produce oxygen-enriched air for future using in micro-turbines and/or fuel cells.